JUPITER'S SIXTH SATELLITE.—A further telegram respecting the recently discovered sixth satellite of Jupiter has been received from the Kiel Centralstelle. It contains a statement from Prof. Perrine that the object discovered by him is not identical with Prof. Wolf's minor planet 1905 P.V. The position of the satellite on January 17 at 8h. 44.3m. (Lick M.T.) was R.A. = 1h. 21m. 8s., dec. = +7° 27′.

A later telegram than the above, published in a supplement to No. 3990 of the *Astronomische Nachrichten*, states that Prof. Perrine observed the satellite on January 17.702 (G.M.T.), and found that its position with reference to Jupiter was 266° and its distance 36′.

EPHEMERIS FOR COMET 1904 *e*.—The following is the latter part of a daily ephemeris for comet 1904 *e* (Borrelly) published by Herr M. Ebell in No. 3989 of the *Astronomische Nachrichten*.

1905	α (true) h. m. s.	δ (true) ° ′	log r	log Δ	Brightness
Feb. 1	2 9 8	+15 17	0·2092	0·1501	0·58
2	2 11 7	+15 54			
3	2 13 6	+16 31			
4	2 15 7	+17 7			
5	2 17 8	+17 43	0·2133	0·1638	0·54

Brightness at time of discovery = 1.0 (= mag. 10.0).

From the above it will be seen that the comet is now travelling in a north-easterly direction through the constellation Aries, and is observable—although very faint—between sunset and midnight.

SOLAR ECLIPSE PROBLEMS.—In an address read at the International Congress of Arts and Sciences, held at St. Louis in September, Prof. Perrine enumerated and discussed a number of the outstanding problems which still confront solar eclipse observers.

The first problem mentioned was that relating to the existence of an intra-mercurial planet, and Prof. Perrine states that this year's eclipse ought to settle the problem so far as the existence of a body brighter than the tenth magnitude is concerned. Such a body would not be above 12 or 15 miles in diameter, and it would take about a million such to account for the anomalies in the motion of Mercury.

The movements and velocities of coronal matter are most important problems which should be settled, and, as stations situated so far apart as Labrador and Egypt may be utilised during the coming eclipse, this should offer an exceptional opportunity of solving the problem, because of the length of time between the passing of the shadow at these places. Prof. Perrine suggests the employment of cameras having focal lengths of 40 or 50 feet and pointed directly at the sun, or, where the atmospheric conditions are favourable, longer cameras, mounted horizontally, might be used. The rotational velocity of the corona as regards that of the sun's surface is another problem which he discusses. Finally, he points out the urgent need for a number of well-equipped and well-organised expeditions, and suggests that the interchange of plans and ideas before the eclipse takes place might lead to results of greater value being obtained.

THE CONDITIONS IN THE SOLAR ATMOSPHERE DURING 1900–1.—An interesting discussion of the conditions obtaining in the solar atmosphere during the minimum epoch of 1900–1, as indicated by the author's eclipse photographs taken in Spain and Sumatra, is given in the January number of the *Bulletin de la Société de France* by M. N. Donitch, of St. Petersburg. He discusses in turn the spectra of the chromosphere, the prominences and the corona, the form of the corona, and the solar repulsion theory of Prof. Bredichin as applied to the latter.

In discussing the spectrum of the chromosphere, he refers to Sir Norman Lockyer's eclipse results, and, in directing special attention to the lines at λλ 5317.7 and 4233.8 (Donitch), he states that his results as to the non-agreement of these with the monochromatic coronal radiations incontestably confirm the conclusions arrived at from the English observations.

The spectra obtained by M. Donitch show that the prominences may be divided into two types, one composed entirely of calcium vapours, the second containing in addition hydrogen and helium.

TRIANGULATION OF THE PLEIADES STARS.—An important addition to the data concerning the positions, the intermutual distances, and the movements of the Pleiades stars is contained in parts vi. and vii., vol. i., of the *Transactions* of the Astronomical Observatory of Yale University.

During 1884–6 the director, Dr. Elkin, made a series of heliometer observations for the triangulation of the Pleiades, and published the results in part i. of the same volume of the *Transactions*. Since then, however, a new source of systematic error affecting such results has been discovered, and Dr. Elkin has, therefore, re-reduced his observations. The final values are given in part vi., and are therein compared with the similar results obtained at Königsberg in 1840 and those obtained during the more recent triangulation carried out at Yale. The results of these comparisons indicate a motion, in regard to the rest of the group, of 9 out of the 58 stars common to the three researches; the apparent displacements determined from the comparison of the Königsberg and Yale results are shown on a chart accompanying the present paper.

Part vii. of the publication contains an account of the second triangulation carried out at Yale by Mr. Mason F. Smith during the winters of 1900–1 and 1901–2, and shows the complete reduction of the observations, together with a final table in which the places of 58 Pleiades stars, for 1885.0, are given with the precession and secular variation values for each.

A BRIGHT METEOR.—Mr. J. Ryan, writing from the Manor House, Kensal Green, N.W., states that he observed a very brilliant meteor at about 11.58 on the night of January 27. The meteor appeared about three degrees below Orionis as bright as a star of the first magnitude; it travelled slowly in a path nearly parallel to a line joining κ and β Orionis, increasing in size until it burst into a green ball when below β Orionis, and faded. The complete path was traversed in about 8 seconds.

THE GENERAL MOTION OF CLOUDS.

THE issue of the *Quarterly Journal of the Royal Meteorological Society* for October, 1904, contains a translation of the report on the international observations of clouds presented by Prof. H. H. Hildebrandsson to the Permanent International Committee during its session at Southport in 1903. It is not too much to say that this report is one of the most important contributions to our knowledge of the physics of the atmosphere which the last twenty-five years have brought forth, and the Royal Meteorological Society has rendered a substantial service by making the report accessible to English readers.

Our knowledge, from direct observations, of the average motion of the air over the greater part of the earth's surface has been in a sense complete for a considerable number of years, but of the currents in the upper air we have until recently had little or no direct information, and all schemes of a general circulation of the atmosphere as a whole have had to substitute hypothesis for fact in dealing with this part of the subject. It therefore became of the highest importance to see whether any direct evidence could be obtained on this point. The most obvious method of attacking the problem consisted in observing the direction and speed of drift of dust or water particles suspended in the atmosphere. Dust particles are seldom sufficiently numerous in the upper air to be of use in this connection, but clouds occur in all parts of the world, and their observation is comparatively easy. Even this method, however, has its limitations. Observations are clearly impossible on cloudless days, and it also frequently happens that the upper clouds are obscured by lower cloud forms.

To obtain any general results observations from every part of the earth's surface were essential, and to secure these the ponderous machinery of international cooperation had to be called into play. In the year 1878 a request was addressed to the Permanent International Committee to organise a comprehensive system of cloud observations. After some preliminary consultations a scheme, in which cloud forms were divided into two classes, viz. upper and lower clouds, was adopted, and observations on this plan

were made for several years during the 'eighties. Comparison of the results, however, showed that the adopted classification was inadequate, and it became necessary to agree on a more complete subdivision of cloud forms. This task proved to be by no means an easy one, but eventually our present international classification of clouds into ten main types was adopted, and some years later, early in 1896, the international cloud atlas, which contains twenty-eight coloured plates illustrative of cloud forms, together with explanatory text in three languages, was published.

At the request of the committee, cloud observations were carried out at a large number of stations during the period from May 1, 1896, to the end of 1897. At the more important stations the height and the direction of motion of clouds were determined by means of the photogrammeter or with theodolites; at the remainder, direction only was observed with the help of nephoscopes.

The materials thus accumulated, as well as a large number of trustworthy observations of earlier date, are discussed by Prof. Hildebrandsson in the present report. The method adopted has been to work out, for each region of the earth's surface, the direction of the average monthly drift of the atmosphere at various heights with a "resultantometer" devised by Mr. Sandström. The results are set out in tables and diagrams, and in what follows attention will be directed to some of the most important points.

I.—*Tropical Zone.*

Observations at stations near the equator agree in showing a drift of the upper atmosphere from some easterly point at all seasons of the year. At Paramaribo (Dutch Guiana, lat. 5½° N.), out of 270 observations of upper clouds, only 6 were from south-east and five from north-east. This well marked easterly current in the uppermost regions of the air near the equator was revealed in a most singular manner during the eruption of Krakatoa in 1883. The optical effects produced by the fine dust, which was carried up to great heights, travelled round the earth from east to west in about twelve or thirteen days, indicating an upper east wind moving with the prodigious velocity of 83 miles per hour.

II.—*Trade-wind Zone.*

The generally accepted theory of the origin of the trade winds formulated by Halley and completed by Hadley teaches us to expect upper anti-trade winds from south-west or north-west in the northern and southern hemispheres respectively, and this expectation was found to be fully confirmed. At Mauritius, which lies in the centre of the region over which the south-east trade wind prevails, the cloud observations show a steady upper wind from the north-west throughout the year. We may therefore assume the existence of an upper wind from the south-west at corresponding latitudes in the northern hemisphere.

As more temperate regions are approached this south-westerly wind becomes deviated to the right, and at Teneriffe, and still more decidedly at San Fernando and Lisbon, the average drift at the cirrus level is from almost due west. No support is afforded to the assumption made by James Thomson and by Ferrel in their schemes of the general circulation of the atmosphere, that the anti-trade wind continues its course as an upper south-westerly wind until the Arctic regions are reached.

Special interest attaches to the observations from the region between the upper equatorial east wind and south-westerly or north-westerly anti-trade winds. On the northern side of the equator, at surface level, a broad band on the earth's surface is alternately covered in winter by the north-east trade wind and in summer by the tropical belt of calms. At higher levels a similar alternation is shown. In winter, when the trade wind prevails at the surface, the anti-trade from south-west blows above, but in summer the tropical upper east wind is found above the calm region at the surface. The observations from square No. 39 of the Atlantic Ocean, which is situated in 10°–20° lat. N., 20°–30° long. W., form the most complete example of this alternation in Prof. Hildebrandsson's report; some further very striking instances are to be found in the cloud results for the West Indies recently published by the U.S. Weather Bureau (*Monthly Weather Review*, vol. xxxii., No. 4, p. 166).

III.—*India.*

The wind circulation over India is exceedingly complex at the surface, but at higher altitudes a much simpler state of affairs is found to prevail. Prof. Hildebrandsson divides his observations into two groups, those from the north (Lahore to Calcutta) and those from the more central districts between Bombay and Cuttack. He finds that in the former the upper currents blow steadily from the west from December to April, but during the remainder of the year they tend to become easterly. Over Central India the upper westerly wind prevails throughout the year, except in August and September. Since the appearance of the report, Sir John Eliot has dealt with the detailed cloud observations taken at six Indian stations during the years 1896–1900 (*Indian Meteorological Memoirs*, vol. xv., part i.). These show a much steadier upper westerly current in the north. At Simla and Jaipur the average upper wind is westerly throughout the year; at Lahore and Allahabad an easterly component appears in the averages for August and September only. Further to the south we find an alternation similar to that described above. At Madras the equatorial upper current from the east prevails during the summer; in winter the upper currents vary between south and south-west.

IV.—*Temperate Zone.*

Throughout the temperate zone the direction of the average upper currents is from some westerly point all the year round in both hemispheres, though few observations are available from the south of the equator. In Europe and in North America there is thus substantial agreement between the general drift of the atmosphere at all levels, but when we turn to eastern Asia this is not the case. The excellent observations taken at the Observatory of Zikawei (Shanghai) show that at the surface and at the level of the lower clouds the prevailing direction is from the north during the winter and from the east, *i.e.* towards the low pressure system over the continent of Asia, during the summer; but already at the level of the intermediate clouds, and still more at higher levels, a steady drift from the west is found at all seasons. Similar results are shown by the observations from Japan.

Though there is substantial agreement in the mean direction of air motion over Europe at all levels, a general tendency for a component from the north to make its influence increasingly felt at higher altitudes is clearly shown. Thus at Upsala, during the winter months, the surface wind is from the south-west; the lower clouds travel from west-south-west and the intermediate ones from west-north-west, while at the cirrus level the direction of motion is from north-west. Further north, at Nora, in Swedish Lapland, cirrus moves from north-west throughout the year. Some particularly interesting results have been obtained from those of M. Teisserenc de Bort's balloon ascents in which the level of the highest cloud forms was exceeded. In all these cases the balloons were carried towards the south-east, showing that they met with a north-westerly wind in the uppermost layers of the atmosphere.

North-westerly winds at the cirrus level are also very prominent at Perpignan, Pola (Austria), Tiflis, and Madrid, stations which lie on the northern side of the tropical belt of high pressure, over which, as we have seen above, the direction of the anti-trade winds has become deviated from south-west to west.

Prof. Hildebrandsson sums up the results he has arrived at under the following headings:—

(1) Above the thermal equator and the equatorial calms there exists throughout the year a current from the east which appears to have a very high velocity at great altitudes.

(2) Above the trade winds, anti-trade winds from south-

west in the northern hemisphere and from north-west in the southern hemisphere prevail.

(3) These anti-trade winds do not extend beyond the polar limits of the trade winds; they are deviated to the right in the northern hemisphere and to the left in the southern, and become currents from the west above the tropical high pressure areas, where they descend to feed the trade winds.

(4) The air of the temperate zones is involved in vast "polar whirlpools," which rotate from west to east. This rotatory movement appears to be similar to that of ordinary cyclones; the air in the lower layers draws nearer to the centre of the whirl, while that in the upper layers recedes from it more and more as the height above the earth's surface increases up to the highest regions from which we have any observations.

(5) The layers of upper air of the temperate zones overflow the tropical high pressure areas, and there descend.

(6) The irregularities found at the surface of the earth, more particularly in the monsoon areas of India, disappear, as a general rule, at the level of the lower or intermediate clouds.

(7) The theory of a vertical circulation of the atmosphere between the tropics and the poles, which has hitherto been accepted (Ferrel, James Thomson), must be abandoned.

The report as published in the society's journal is very fully illustrated by reproductions of the diagrams of the original edition. M. Teisserenc de Bort's charts of the average distribution of pressure at the 4000-metre level for January and July are also given, and they illustrate in a very striking manner the scheme of general circulation of the upper air to which the results of Prof. Hildebrandsson's report point.

AMERICAN HYDROIDS.[1]

THE first part of this large work dealt with the plumularian hydroids. After an interval of four years, the second part, a folio of some 150 pages and 57 plates, has been issued. It appeals exclusively and intentionally to the student of systematic zoology; but owing to the wide distribution of the family—the "sea-firs" of our coasts—this account, though dealing primarily with American species, will assist students of sertularian taxonomy in almost any part of the world.

The plan of this book is that of the first part. There is first an anatomical account of the stem and its branches, then a *résumé* of the distribution, horizontal and vertical, in different seas, and finally a hundred pages of speciography. The most assiduous care has been employed in drawing up these descriptions and in illustrating them by well selected figures; and most critical and generous consideration is given to previous researches on this group of animals.

For some not very obvious reason, Prof. Nutting has decided to postpone the more interesting bearings of his subject to the final volume, and confines himself in the work before us rigidly to a consideration of the taxonomic and diagnostic features of the Sertularidæ. We look in vain for any explanation of the mode of distribution, though the occurrence of the majority in Alaskan and Arctic waters suggests a polar origin. There is no attempt to explain the absence of free medusæ, nor are we given any information as to the habits of these hydroids, their modes of growth and of repairing injury, the influence of light upon their branching and reproductive powers. There is not a single experiment recorded in the work, though it is to be expected from the plasticity of such cœlenterates that continuous and discontinuous variation may be induced by changes in environment. On the other hand, differentiating anatomical characters, such as the forms of branching, the shape of the gonidial sacs, and the opercula, are described and combined into a system with great care, and it is to be hoped that Prof. Nutting has laid the foundation of a permanent and authoritative classification.

[1] "American Hydroids. Part ii. Sertularidæ." By C. C. Nutting, Smithsonian Institution. U.S. National Museum. Special Bulletin. (Washington, 1904.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Vice-Chancellor has been informed that at a meeting of medical graduates recently held in London to consider the present provision in the university for the department of pathology, it was resolved (1) that steps should be taken to bring before the university the necessity of permanent and adequate support being received for the pathological department; (2) that a fund be started for the purpose of assisting in this object, and the primary object of this be the establishment and endowment of a professorship in pathology.

It was announced last term that the Rhodes trustees have made a grant for five years to Dr. Ritchie, the present reader in pathology, and New College has now elected him to an ordinary fellowship for seven years, provided that he continues his readership and does research work. Mr. Edward Whitley, Trinity College, has very generously given the university a thousand pounds towards the permanent endowment of a pathology chair.

CAMBRIDGE.—The Vice-Chancellor announces two important bequests which have been left to the university. The first consists of 5000*l.*, to be expended in improving the instrumental equipment of the Newall Observatory, and of a very valuable collection of illuminated manuscripts and early printed books and objects of mediæval and early art, to be placed in the Fitzwilliam Museum, left by Mr. Frank McClean, F.R.S., of Trinity College. The second bequest is left by the late editor of the *Athenaeum*, Mr. Norman Maccoll, of Christ's and Downing Colleges, and consists of 500*l.* to form some endowment for a lectureship in Spanish or Portuguese, together with a valuable library of books.

The number of commissions allotted to the university, the first half-yearly nomination to which will take place after the examination in September next, is one in the Royal Artillery, one in the Indian Army, and five in the cavalry, Foot Guards, infantry, or the Army Service Corps.

The regulations for administering the Gordon Wigan fund are announced. The revenue will be divided between the special board of physics and chemistry and the special board of biology and geology, to be used in promoting and encouraging scientific education and research. The bequest amounts to some 9000*l.*

LONDON.—Mr. William Loring, late director of education under the County Council of the West Riding of Yorkshire, has been appointed warden of the Goldsmiths' College, New Cross, and Mr. Edgar Schuster Francis Galton research fellow in national eugenics.

The Mercers' Company has voted a sum of 1000*l.* to the university for the promotion of the study of physiology at University College.

Mr. W. Williams has been awarded the degree of doctor of science through a thesis on "The Temperature Variations of the Electrical Resistances of Pure Metals," and other contributions.

Mr. H. M. Hobart has been appointed lecturer in electrical engineering design at the Northampton Institute in succession to Mr. E. K. Scott, who has been appointed lecturer in electrical engineering in the University of Sydney. Mr. M. H. Smith has been appointed chief assistant in the mechanical engineering department in succession to Mr. W. E. Curnock, who has been appointed head of the mechanical engineering department of the Technical College, Huddersfield.

MANCHESTER.—The new public health laboratories, which have been erected by the Victoria University and have cost 13,000*l.*, were opened on January 27 by Mr. W. J. Crossley. Lord Spencer, Chancellor of the University, presided at the ceremony, and the large gathering included the Lord Mayor of Manchester and the Mayor of Salford. Honorary degrees were afterwards conferred upon Prof. Calmelle, Lille University; Prof. Perroncito, Turin University; Prof. Salomonsen, Copenhagen University; and Captain R. F. Scott, R.N.

IT has been resolved to institute, in the United College, University of St. Andrews, a lectureship in organic